The second volume of this report is on Mines and Miners, being the report of the State Inspector. Only the first half is interesting to statisticians, the latter half being taken up with lists of companies and the "Record of Inspection." The figures given were reported by the mine operators themselves, and "every effort was made to obtain complete and accurate returns." It is a valuable contribution.

The methods employed by the PENNSYLVANIA Bureau are very antiquated. The first 205 pages of the report are given up to answers to questions as to causes of change in the value of farming land, which, of course, are not statistics. Tables follow this, showing, by townships, the number and acreage of farms, and whether occupied by owner or tenant. A small table on page 224 gives the price of agricultural implements annually from 1870 to 1889 inclusive, following which are long price lists of farm products for a series of years, and lists of transportation rates. The next inquiry, relating to miners' earnings, is the conclusion of last year's report. A praiseworthy attempt has been made to steer clear of the "average" fallacy, but it has not been altogether successful. Building and loan associations have been pretty thoroughly investigated, and the statistics given here are as good as any in the book. There is an "article" on the carpet industry, with numerous pictures and few statistics, and the opinions of workingmen occupy the last sixty-five pages.

FRANK R. HATHAWAY.

NOTES ON PRESIDENT WALKER'S ARTICLE ON STATISTICS OF THE COLORED RACE.

(1) NOTE BY PROF. H. A. NEWTON, YALE UNIVERSITY.

By taking the numbers in Column 2 of President Walker's table, giving the enumeration of the colored population, from 1790 to 1880 (*Publications of the American Statistical Association*, December, 1890, p. 102), and regarding 10,000 as the unit, we may construct a table of first and second differences as follows: —

TABLE I.

Year of Census.	Colored Population.	First Difference.	Second Difference.
1790	76	..	...
1800	100	24	...
1810	138	38	14
1820	177	39	1
1830	233	56	17
1840	287	54	—2
1850	364	77	23
1860	444	80	3
1870	488	44	—36
1880	658	170	126

The irregularity in the column of second differences shows large variations in the decennial increments of a population not subject (at least after 1810) to great changes from immigration or emigration. These variations may be due to actual irregularities in numbers of population, or to errors of counting, or to both. In fact, both causes must operate to some extent to produce the irregularities in Column 2. The numbers of the column do not enable us to ascribe to each cause its due influence, but they do furnish the means of estimating the total amount of the irregularity in Column 2 arising from the combined causes, especially the amount of the great deviation in 1870. Let us construct for this purpose a new series of numbers whose second differences shall increase regularly, the third differences being therefore constant, a series that shall differ as little as possible from the numbers in the second column of the table above. By trial I find that with the first term 75, the first first-difference 27, the first second-difference 7, and the third differences constantly unity, we obtain a fair approximation to the numbers in the column named. Calling the two sets of numbers respectively the *observed* and the *computed*, and adding two columns of differences, and a column of observed-computed, we make the following table: —

TABLE II.

Year.	Observed.	Computed.	First Difference.	Second Difference.	Observed-computed.
1790	76	75	...	. .	+1
1800	100	102	27	...	−2
1810	138	136	34	7	+2
1820	177	178	42	8	−1
1830	233	229	51	9	+4
1840	287	290	61	10	−3
1850	364	362	72	11	+2
1860	444	446	84	12	−2
1870	488	543	97	13	−55
1880	658	654	111	14	+4

The numbers in the third column exhibit evidently the general law of growth of the numbers in the second column, if the number for 1870 be left out of account. Compared, then, with a steadily increasing people, the deficiency in 1870, due to defective numeration, and to a real deficiency of population if that existed, is about 550,000.

The signs of the numbers in the last column are (omitting 1870) alternately plus and minus, so that it is not possible to obtain a smoothly increasing series of numbers that will represent Column 2 much better than that in Column 3. This alternation further shows that deductions from growth in intervals of 20 years are much more valuable than those from intervals of 10 years or of 30 years.

To test, however, the possibility of obtaining a better series than Column 3, I assumed an unknown correction to each of the numbers 75, 27, 7, and to the 3rd difference that had been used in computing Column 2. *Fourth differences I assumed as before equal to zero.* Then, by the method of least squares, I computed the most probable values of those unknown corrections. Of course the year 1870 was omitted. The result was a series of numbers a very little, and only a very little, better than those in Column 3 in Table II. The sum of the residual squares was reduced from 59 to 54.5. The resulting number for 1870 was 5,431,000, essentially the same as before.

(2) NOTE BY HERMANN HOLLERITH, PH.D.

The comparisons heretofore made for the purpose of demonstrating or illustrating the defective enumeration of the colored population at the census of 1870 have been so made as not to eliminate the most

variable factor, *i. e.*, natural increase, which, as we know from the age tables of the censuses of 1870 and 1880, fluctuated greatly during the decades 1860 to 1880, due to variation in the birth rate.

It would seem desirable, therefore, that the comparison be made in such a manner that the birth rate, with its natural fluctuations, be eliminated.

This can most readily be done by means of the age tables, under the assumption that there is neither immigration or emigration of the colored population, or else that these factors counterbalance each other. The survivors of the colored population at one census should be enumerated at the next census as the colored population ten years of age and over.

If we compare in this manner the censuses of 1840, 1850, 1860, 1870, and 1880, we find that —

Of 1000 colored persons enumerated in 1840, 870 survived in 1850.
" 1000 " " " " 1850, 848 " " 1860.
" 1000 " " " " 1860, 794 " " 1870.
" 1000 " " " " 1870, 928 " " 1880.

In comparing the censuses in this way, we eliminate entirely the effect of variations in the birth rate, which we know has fluctuated greatly since 1850. Evidence of this is clear and positive in our age tables. The birth rate was checked during the period of the war, and was abnormally high immediately after the war, and during the decade of 1870 to 1880.

It might be contended that the death rate during the war was abnormally large, and that this would account for the number of survivors from 1860 to 1870 being so low, but, on the other hand, this would not, by any means, account for the fact that, according to the census, 928 out of each 1000 colored population at 1870 survived to 1880, as against 848 from 1850 to 1860.

Again, if we make a similar comparison for the native whites, we find that of each 1000 enumerated in 1870 only 917 were surviving in 1880. According to these figures, it would appear that there was a lower rate of mortality among the colored than among the native whites during the period from 1870 to 1880. This we know is contrary to all careful observation in cities having a large colored population, and a thorough registration of deaths.

There is but one possible explanation of these discrepancies, namely, the defective enumeration of the census of 1870.

To determine, as far as we can from these figures, the probable deficiency of the colored enumeration of 1870, let us compare the total colored population in 1850 with the colored population in 1860, ten years of age and over. We find the former to be 1.18 times the latter. If we compare in the same manner the total colored population in 1840 with the colored population ten years of age and over in 1850, we find them to be in the ratio of 1.15 to 1. In 1880 there were enumerated 4,611,207 colored persons ten years of age and over, which multiplied by the factor 1.18 would show that there should have been 5,400,000 total colored population in 1870, so to have left surviving the above number in 1880, on the assumption that the mortality and the age distribution of the colored population was the same during the decade 1870 to 1880 as in the decade 1850 to 1860. If, however, we apply the ratio obtained from 1840 to 1850, we would have the total colored population of 1870 as 5,300,000. Upon a consideration of the above figures, it would seem that the total colored population in 1870 should have been between 5,300,000 and 5,400,000.

THE BIRTH RATE IN EUROPE DURING THE LAST TWENTY YEARS.

The slight increase of the population of France has lately attracted much attention. A fresh examination of the birth rate by Charles Richet appears in the January number of the *Revue Scientifique*, of which the following is a summary: —

The decline in the increase of the population of France, already noticeable at the beginning of the century, continues to increase each year. During the last ten years it has grown so marked that no little uneasiness has been aroused by it. M. Richet does not attempt to smooth over this fact, or to reassure people by denying its validity. He simply compares the condition of France with that of other countries, and shows that there is a general demographic phenomenon, since, in all the principal countries of Europe, for several years past, the birth rate has shown a tendency to decrease.

For this purpose he takes the bare figures, that is, the number of births per 1000 inhabitants. In order to be thorough it would be necessary to consider other facts, such as not only the total population, but the households where the women are between 20 and 45